WHAT IS CLAIMED IS:

1. A method of making a semiconductor heterostructure, comprising the steps of:

a) providing a substrate;

b) forming a nitride buffer layer on the substrate to form a buffer-layered substrate, wherein the buffer layer is formed by a first deposition technique; and

c) forming an nitride epitaxial layer on the buffer layer, wherein the epitaxial layer is deposited by a second deposition technique, and the second deposition technique is different from the first deposition technique.

2. The method of claim 1, wherein said step b) comprises forming the buffer layer by MOCVD.

3. The method of claim 1, wherein said step c) comprises forming the epitaxial layer by hydride vapor-phase epitaxy.

4. The method of claim 1, wherein the epitaxial layer comprises a nitride of an element of groups III and IV of the periodic table.

5. The method of claim 1, wherein the substrate comprises a material selected from the group consisting of sapphire, silicon, silicon carbide, and gallium arsenide, and the buffer layer comprises aluminum nitride, ZnO, MgO and GaN.

6. The method of claim 1, wherein the epitaxial layer comprises metal nitride comprising at least one metal selected from the group consisting of gallium, aluminum and indium.

7. The method of claim 1, wherein the buffer layer has a thickness in the range of 1.0 nanometer to 1.0 micron.

8. The method of claim 1, wherein the epitaxial layer has a thickness of at least 1 micron to 500 micron.

9. The method of claim 1, further comprising the step of:

d) *in lieu of* said step c) and after said step b), forming a cap layer on the buffer layer; and

e) forming the epitaxial layer on the cap layer.

10. The method of claim 9, wherein said step d) is performed by MOCVD and said step e) is performed by HVPE.

11. The method of claim 9, wherein the cap layer comprises a nitride of an element of groups III and IV of the periodic table.

12. The method of claim 9, wherein the cap layer and the epitaxial layer each comprise a metal nitride comprising at least one metal selected from the group consisting of gallium, aluminum, and indium.

13. The method of claim 1, wherein said step b) is performed in a MOCVD chamber, and said step c) is performed in a HVPE reactor, and said method further comprises the steps of:

f) after said step b), removing the buffer-layered substrate from the MOCVD chamber; and

g) arranging the buffer-layered substrate in the HVPE reactor.

14. A method of making a semiconductor heterostructure, comprising the steps of:

a) providing a substrate;

b) forming a buffer layer on the substrate to form a buffer-layered substrate;

c) forming a cap layer on the buffer layer; and

d) forming an epitaxial layer on the cap layer, wherein the buffer layer and the capping layer are formed by CVD and the epitaxial layer is formed by HVPE.

15. The method of claim 14, wherein said step d) is replaced by forming the epitaxial layer on the cap layer, wherein the buffer layer and the capping layer are formed by MBE and the and the epitaxial layer is formed by HVPE.

16. The method of claim 14, wherein said step c) is performed by a process selected from the group consisting of MOCVD, MBE and sputtering.

17. The method of claim 14, further comprising the step of:

e) removing a portion of the heterostructure from the substrate.

18. The method of claim 14, wherein the substrate comprises a material selected from the group consisting of sapphire, silicon, silicon carbide, and gallium arsenide; the buffer layer comprises AlN; and the epitaxial layer comprises GaN.

19. The method of claim 14, wherein the buffer layer and the epitaxial layer have a combined thickness in the range of 1.0 micron to 500 micron.

20. The method of claim 14, wherein the epitaxial layer has a thickness in the range of 1.0 micron to 500 micron.

21. An epitaxial layer, comprising a metal nitride comprising a metal selected from the group consisting of gallium, aluminum and, wherein the epitaxial layer is formed by hydride vapor-phase deposition on a buffer layer and wherein the buffer layer comprises a nitride of an element of groups III or IV of the periodic table formed on a substrate by a method selected from the group consisting of MOCVD, MBE or sputtering.

22. The epitaxial layer of claim 21, wherein said epitaxial layer is removed from said buffer layer.

23. The epitaxial layer of claim 21, wherein said epitaxial layer and the buffer layer together comprise an epitaxial layer/buffer

layer heterostructure, and the epitaxial layer /buffer layer heterostructure is removed from the substrate.

24. A semiconductor heterostructure, comprising:

a) a buffer layer, said buffer layer formed by MOCVD; and

b) an epitaxial layer deposited on said buffer layer, said epitaxial layer formed by HVPE.

25. The heterostructure of claim 24, wherein said buffer layer comprises a material selected from the group consisting of AlN, InN and GaN, and wherein said buffer layer has a thickness in the range of from about 1.0 nanometer to 1.0 micron.

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26. The heterostructure of claim 25, wherein said epitaxial layer comprises a metal nitride comprising at least one metal selected from the group consisting of Ga, Al and In and wherein said epitaxial layer has a thickness in the range of from about 1.0 micron to 500 micron.

27. An epitaxial layer prepared according to the method of:

a) forming a buffer layer on a substrate by CVD;

b) forming a cap layer on the buffer layer; and

c) forming an epitaxial layer on the cap layer by hydride vapor-phase epitaxy.

28. The epitaxial layer of claim 27, wherein the epitaxial layer comprises a nitride comprising an element selected from group III and group IV of the periodic table.

29. The epitaxial layer of claim 27, wherein the substrate comprises a material selected from the group consisting of sapphire, silicon, silicon carbide, gallium arsenide, zinc oxide and magnesium oxide; and the buffer layer comprises aluminum nitride.

30. The epitaxial layer of claim 28, wherein the cap layer and the epitaxial layer have substantially the same composition.

31. The epitaxial layer of claim 26, wherein the cap layer and the epitaxial layer each comprise a nitride comprising an element selected from the group consisting of group III and group IV elements of the periodic table.

32. The epitaxial layer of claim 27, wherein the cap layer is formed by MOCVD.